

Name

1. 20.6.1 Describe stereoisomers as compounds with the same structural formula but with different arrangements of atoms in space. (2)
 - a. Define a structural isomer:
 - b. Define a stereoisomer and identify the two types:
2. 20.6.2 Describe and explain geometrical isomerism in non-cyclic alkenes. (3)
 - a. Define a geometrical isomer:
 - b. Demonstrate how the double bond in a molecules such as but-1-ene and but-2-ene can (or cannot) be considered geometrical isomers.
 - c. Explain why (using concepts of Topic 14 – HL Bonding) why the presence of a double bond restricts the rotation of the bond compared to that of single bonded molecule:

3. 20.6.3 Describe and explain geometrical isomerism in C3 and C4 cycloalkanes. (3)

- a. Cyclic alkanes can also restrict the free rotation of single bonds. Even though only single bonds may be present, use dichlorocyclopropane and dichlorocyclobutane as examples for geometrical and structural isomers:

i. Dichlorocyclopropane:

ii. Dichlorocyclobutane:

4. 20.6.4 Explain the difference in the physical and chemical properties of geometrical isomers. (3)

- a. In general the physical properties for geometrical isomers are:

i.

ii.

- b. The following is a list of properties for two sets of geometrical isomers.

Isomer	Condensed Structure	Melting Point / K	Boiling Point / K
		134	277
		167	274
		193	333
		223	321

- c. In order to explain this phenomenon, draw the structure of the first set of examples (cis- and trans-but-2-ene).

i. Why does –trans have a higher M.P.?

ii. Why does –cis have a higher B.P.?

5. 20.6.5 Describe and explain optical isomerism in simple organic molecules. (3)

- a. Draw the symmetry of benzene (with the circle) to demonstrate the planes of symmetry:

- b. Draw a 5-sided star and a 6-sided star (two triangles – Star of David), compare the planes of symmetry:

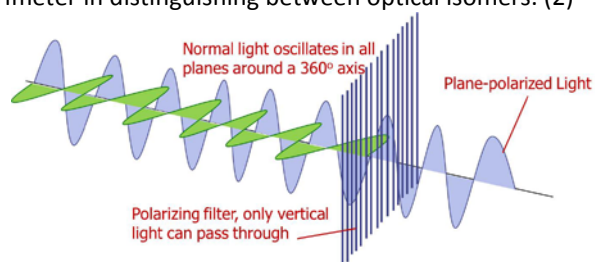
- c. What does it mean to have optical isomerism (or optical activity)?

i. What do we consider these compounds to be?

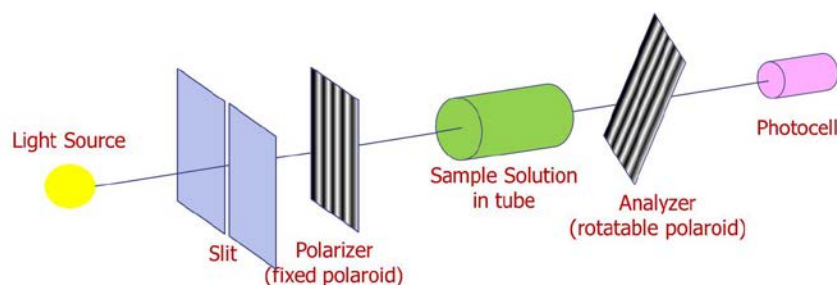
d. Draw a simple example of enantiomers (optical isomers) with a tetrahedral structure:

e. What is a racemic mixture?

6. 20.6.6 Outline the use of a polarimeter in distinguishing between optical isomers. (2)



a. Outline the steps of plane-polarization of light:



b. Nearly all 2-amino acids are considered to be chiral molecules and exist generally in only one enantiomer (with the exception of glycine). Draw the structure of alanine and illustrate the enantiomers:

7. 20.6.7 Compare the physical and chemical properties of enantiomers. (3)